DOCKET NO: 270262US0PCT

IN THE UNITED STATES PATENT & TRADEMARK OFFICE

IN RE APPLICATION Of	:
Tetsuo MIYAYAMA	:EXAMINER: WEBMAN
SERIAL NO: 10/532,832	:
FILED: JANUARY 4, 2006	:GROUP ART UNIT: 1616
FOR: COSMETICS EXCELLENT IN TEXTURE AND OIL-DISPERSIBILITY	:

DECLARATION UNDER 37 C.F.R. §1.132

COMMISSIONER FOR PATENTS
ALEXANDRIA, VIRGINIA 22313

SIR:

Now comes Hajime Ito who deposes and states:

1. I am a graduate of Okayama Univ. and received my M.S. in the year 1992.

2. I have been employed by Idemitsu Kosan Co., Ltd., for 14 years as a researcher in the field of organic synthesis.

3. That the following experiments were carried out by me or under my direct supervision and control.

4. Two raw materials were reacted under the same condition given in Item 6 of this Declaration.

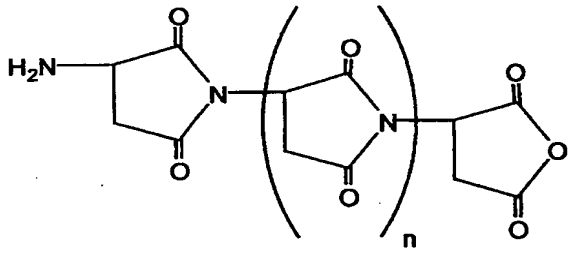
Two crosslinked products were tested for oil dispersibility. The method and results are given in Item 9 of this Declaration.

5. The first raw material was aspartic acid, from which poly-succinimide was produced under the reaction condition given in JP 1995-309943 introduced at [0040] of the reference of JP 2001-0727664.

The second raw material was glutamic acid, which was reacted under the same condition as the first raw material.

6. The reaction condition given in JP 1995-309943 was the temperature of 180 ℃, the pressure of about 5 Torr and the reaction time of 3.5 hours. After the reaction, the mixture was dissolved in dimethylformamide, dropped into water to re-precipitate the produced polymer, pulverized, filtered under reduced pressure, washed by water, and dried.

7. From aspartic acid, poly-succinimide was obtained as white solid by the yield of 95 % under the reaction condition described in Item 6. The IR spectrum of the product is given in Fig. 1.



(I)

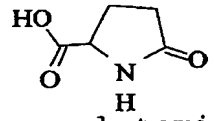
From glutamic acid, a polymer was produced as white solid by the yield of 47 % under the same reaction condition. The IR spectrum of the product is given in Fig. 2.

The IR spectrum of the polymer obtained from glutamic acid is recognized to be greatly different from that of poly-succinimide as described below.

The IR spectrum of poly-succinimide has the absorptions at 1796 cm^{-1} (small) and 1715 cm^{-1} (large) which are characteristic for 5 membered ring imide. These correspond to the absorptions of succinimide, 1780 cm^{-1} and 1695 cm^{-1} although shifted by about 20 cm^{-1}, and are similar in forms.

The IR spectrum of 6 membered ring imide has a large absorption near 1700 cm^{-1} as shown in the case of 3,3-dimethylglutarimide (see "The Aldrich Library of Infrared Spectra" by Charles J. Pouchert). The IR spectrum of the polymer obtained from glutamic acid has peaks at 1776 cm^{-1} and 1694 cm^{-1}, which are different from those for the 6 membered ring imide.

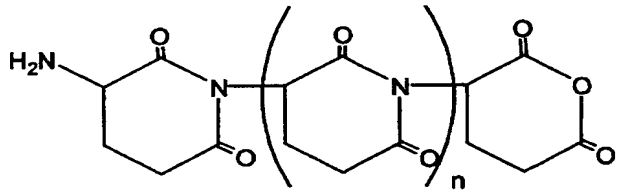
Heating glutamic acid is known to bring the formation of pyroglutamic acid by the intramolecular dehydration (see Monatshefte fur Chemie, 3, P.228, 1882).



pyroglutamic acid

The IR spectrum of pyroglutamic acid has absorptions at 1720 cm^{-1} and 1640 cm^{-1}, which resembles that of the polymer obtained by heating glutamic acid in the forms although shifted by 50 cm^{-1}.

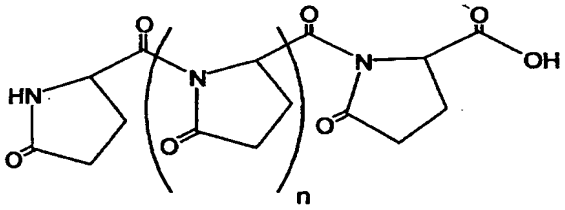
From above results, it is estimated that the polymer obtained by heating glutamic acid is not the polymer of 6 membered ring imide (poly-(glutarimide)) shown by the formula (II),



(I I)

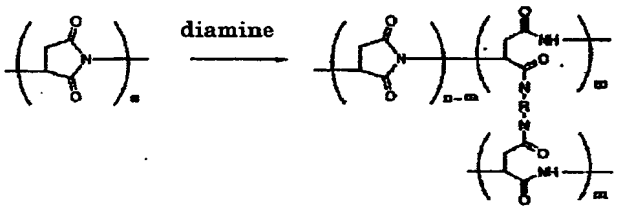
but the polymer shown by the formula (III), which is formed by

the dehydration condensation of pyroglutamic acid formed by the intramolecular condensation of glutamic acid.



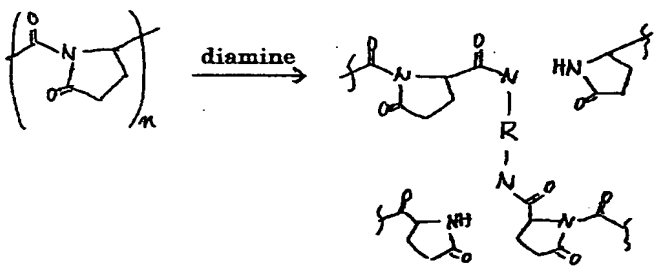
(III)

Crosslinked product of poly(glutamic acid) is formed by partially crosslinking poly-succinimide represented by the formula (I) followed by the alkaline hydrolysis. The partial crosslinking is represented by the following formula as given at [0009] of JP 1995-309943,

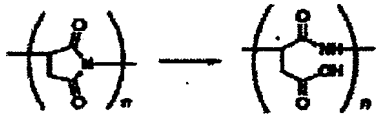


and the unreacted imide rings in the partial crosslinked product are hydrolyzed by alkali metal compound as described at [0013].

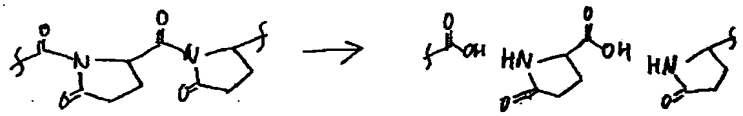
On the other hand, when the polymer represented by the formula (III) obtained from pyroglutamic acid formed by heating glutamic acid was attemped to be partially crosslinked, the three dimensionally crosslinked product could not be obtained because of the proceeding of the reaction of cutting off the principal chain in the polymer of the formula (III) as shown by the following formula.



Moreover, the hydrolysis of the unreacted imide ring in the partially crosslinked product in the case of poly-succinimide of the formula (I) does not accompanied by breaking down the principal chain as represented by the following formula.



On the other hand, in the case of the polymer given by the formula (III) which is formed by the dehydration condensation of pyroglutamic acid, the hydrolysis of the unreacted imide bonding is represented by the following formulation and the final products are compounds of low molecular weights such as pyroglutamic acid.



It is well known that poly-(aspartic acid) and poly-(glutamic acid) which have not crosslinking structure, as well as the compounds of low molecular weights, have not oil dispersibility. Therefore, it is thought that the compound obtained partially crosslinking the polymer represented by the formulation (III) by a diamine followed by the hydrolysis has not oil dispersibility.

8. The results shown in Item 7 show that while the crosslinked poly-(aspartic acid) can be formed from aspartic acid, the crosslinked poly-(glutamic acid) can not be formed from glutamic acid. The crosslinked product of poly-γ-glutamic acid according to the present invention is recognized to have novelty and inventive step.

9. The oil dispersibility of poly-γ-glutamic acid crosslinked by electron beam radiation according to the description in "PRODUCTION EXAMPLE 1" of the present invention was attempted to be compared with that of the poly-γ-glutamic acid crosslinked chemically according to the description in "Example 1" of JP 1999-343339.

The mixture of 100 parts by mass of 0.5 weight % aqueous solution of the respective poly-γ-glutamic acid and 4 parts by mass of liquid paraffin was agitated severely. The states just after the agitation are shown in Fig. 3 and Fig. 4, respectively. And the states after standing for 60 hours are shown in Fig. 5 and Fig. 6, respectively. In the case of the chemically crosslinked poly-γ-glutamic acid, while liquid paraffin was dispersed uniformly just after the agitation (see Fig. 3), it was separated upwardly after standing for 60 hours and the water phase was transparent (see Fig. 5). On the other hand, in the case of poly-γ-glutamic acid crosslinked by the electron beam radiation, the state of the dispersion after standing for 60 hours was maintained similarly as that just after the agitation (see Fig. 4 and Fig. 6).

From the above results, it is found that the oil dispersibility of poly-γ-glutamic acid crosslinked by the electron beam radiation is higher than that of chemically crosslinked poly-γ-glutamic acid. Moreover, the adjustment to the environment is good because no harmful and organic reagents are used. Thus, the crosslinked product of poly-γ-glutamic acid according to the present invention is again recognized to have novelty and inventive step.

10. The undersigned petitioner declares further that all statements made herein of his own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of this application or any patent issuing therefrom.

11. Further deponent saith not.

Hajime Ito
Signature

2006. 11. 10
Date

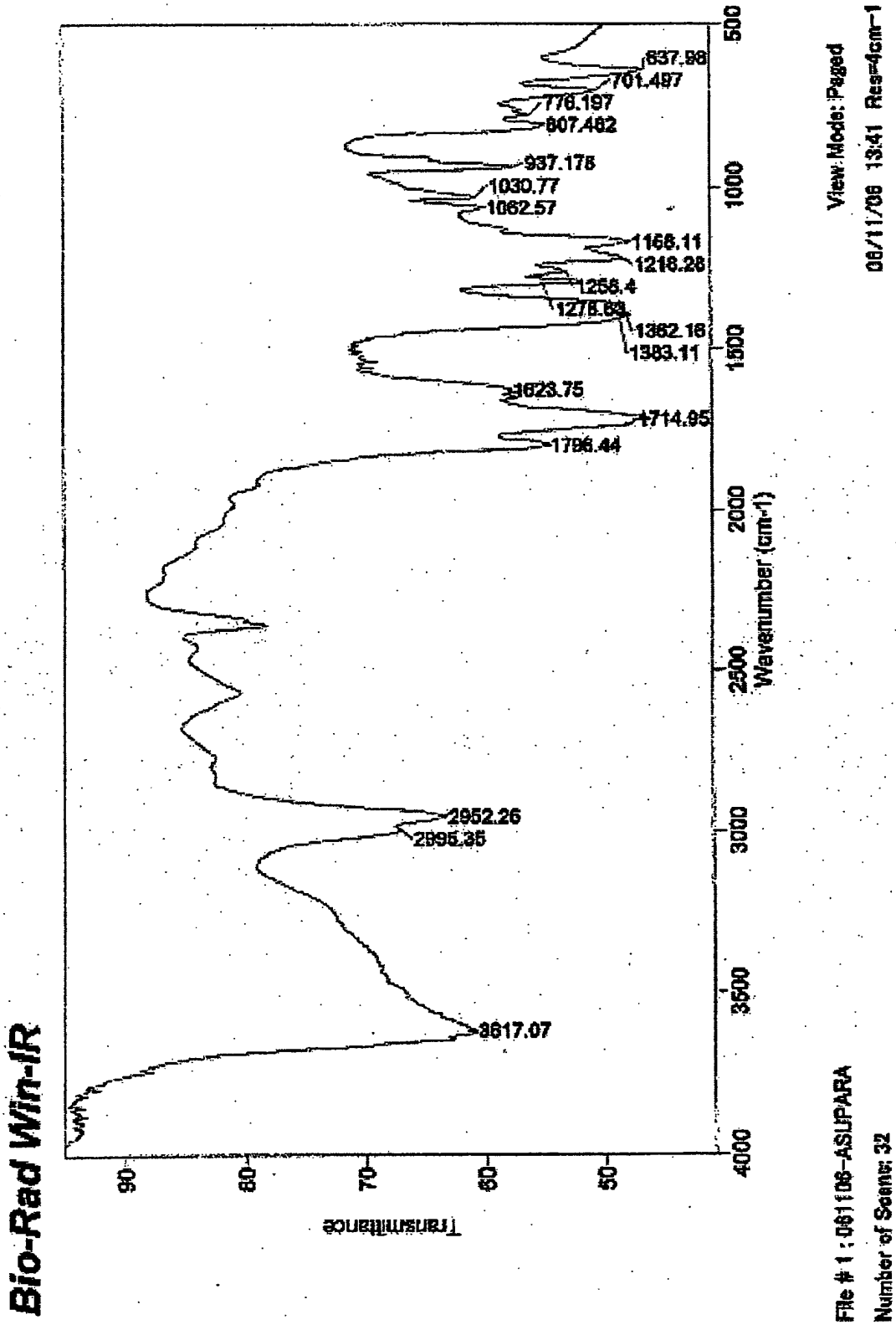


Fig. 1: IR spectrum of heating product of aspartic acid.

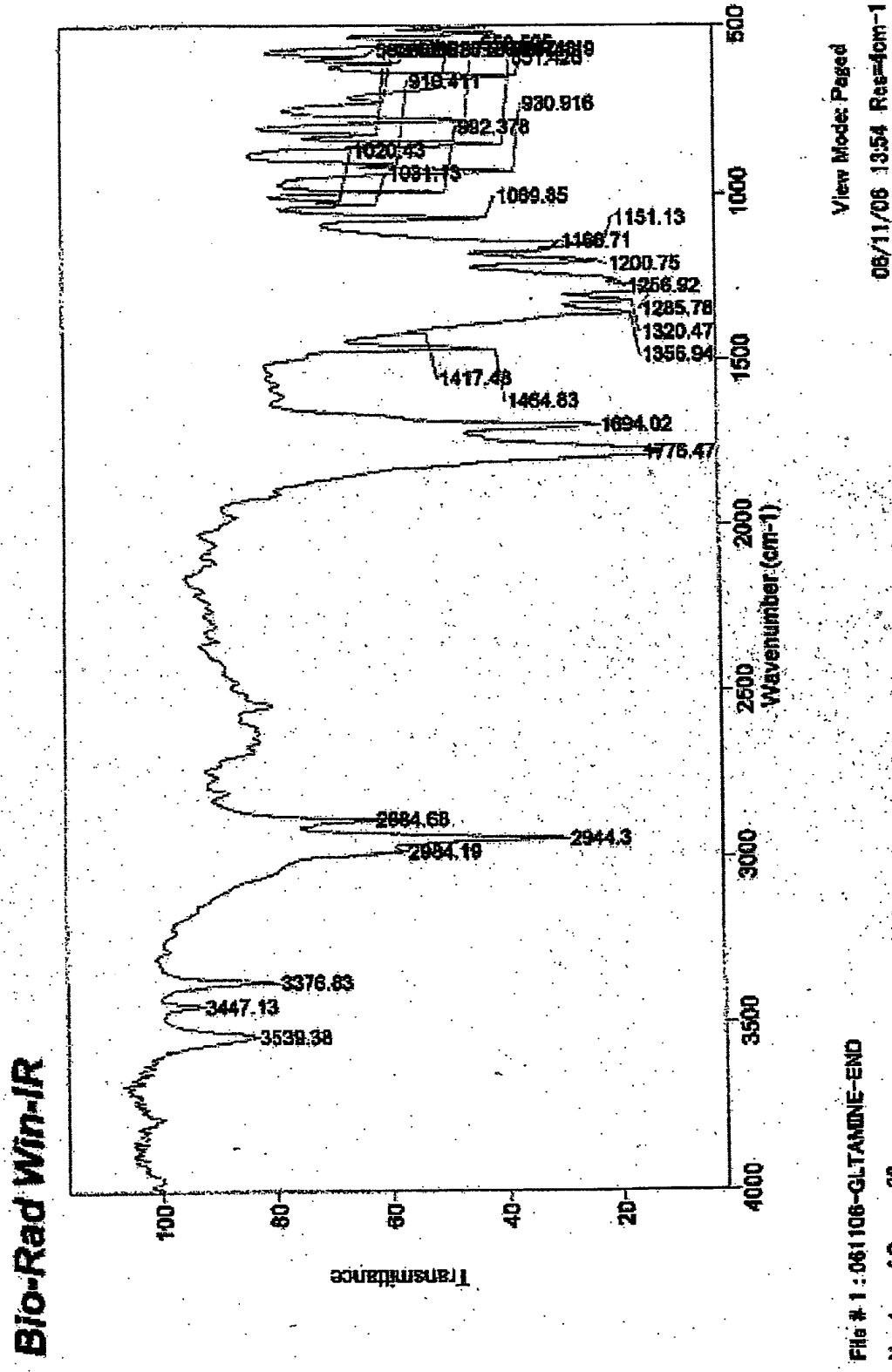


Fig. 2: IR spectrum of heating product of glutamic acid.

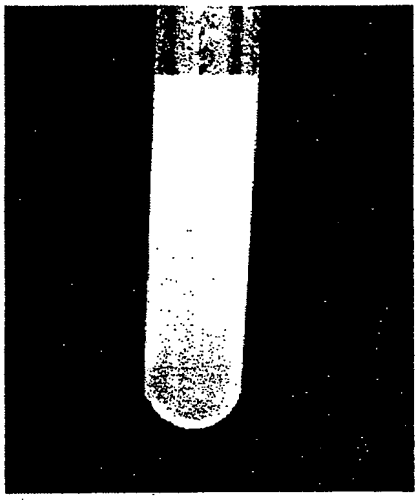


Fig. 3: Chemically crosslinked PGA just after agitation.

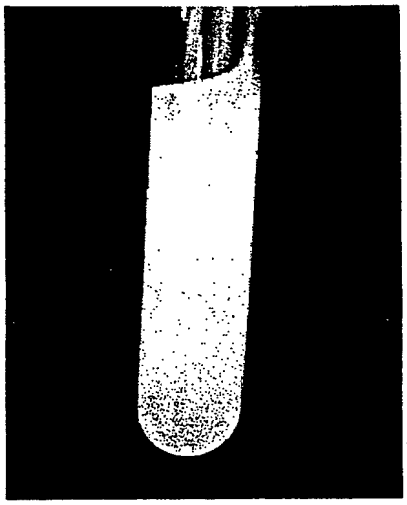


Fig. 4: Electron beam crosslinked PGA just after agitation.

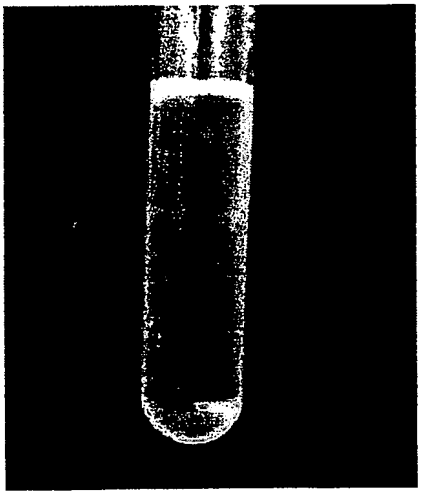


Fig. 5: Chemically crosslinked PGA after standing for 60 hr.

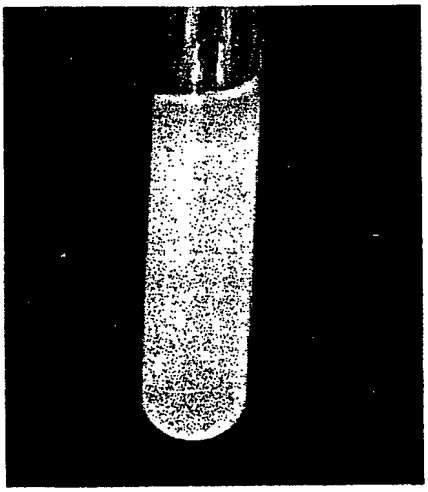


Fig. 6: Electron beam crosslinked PGA after standing for 60 hr.

In Figs. 3 to 6, PGA means poly-γ-glutamic acid.

Vorläufige Mittheilung über Glutaminsäure und Pyrrol.

Von Ludwig Haitinger.

(Aus dem Universitäts-Laboratorium des Prof. A. Lieben.)

(Vorgelegt in der Sitzung am 8. März 1883.)

Erhitzt man Glutaminsäure (Amidoglutarsäure $C_5H_9NO_4$) einige Zeit auf 180°—190°, so entweicht genau ein Molekül Wasser und es hinterbleibt eine schwach gelblich gefärbte Masse, welche durch Umkrystallisiren aus heissem Wasser in grossen, gut ausgebildeten Prismen erhalten werden kann. Dieser Körper ist wie aus der Analyse des Silber und Ammoniumsalzes hervorgeht, eine einbasische Säure und entspricht der Formel $C_5H_7NO_3$, ich will ihn vorläufig Pyroglutaminsäure benennen.

Es ist wahrscheinlich, dass bei der Entstehung der neuen Säure aus Glutaminsäure die Elemente des Wassers theils aus einer Carboxylgruppe, theils aus der Amidogruppe entnommen werden, ähnlich wie dies beim Carbostyril der Fall ist. Nimmt man für die Glutaminsäure eine unsymmetrische Structur an (was in Hinblick auf die optische Activität derselben nicht allzu gewagt erscheinen dürfte), so ist es möglich, dass die aus ihr entstehende Pyrosäure eine Atomgruppirung besitzt, welche der der Pyrrolderivate ähnliche ist. In der That erhält man bei stärkerem Erhitzen von Glutaminsäure oder einem ihrer Salze Pyrrol, welches sich leicht durch die charakteristische Rothfärbung eines mit Salzsäure befeuchteten Fichtenspanes zu erkennen gibt. Die Reaction entspricht der Gleichung:

$$C_5H_9NO_4 = C_4H_5N + 2H_2O + CO_2$$

Durch trockene Destillation von pyroglutaminsaurem Calcium konnte neben anderen höher siedenden Producten eine genügende Menge Pyrrol abgeschieden werden, um letzteres an

Siedepunkt, Verharzung mit Schwefelsäure und Bildung von unlöslichen Metalldoppelverbindungen genügend als solches zu charakterisiren.

Vorstehende Mittheilung dieser bisher noch unvollständigen Untersuchungen hat lediglich den Zweck, mir die Bearbeitung dieses Themas auf einige Zeit zu sichern und hoffe ich bald in der Lage zu sein, weitere Resultate mittheilen zu können.

Wien, den 9. Februar 1882.

PRELIMINARY REPORT ON GLUTAMIC ACID AND PYRROLE

L. Haltinger

(From Professor Lieben's laboratory of university)

(To be presented in conference on March 9, 1882)

Heating glutamic acid (amidoglutamic acid $C_5H_9NO_4$) at 180° - 190° for a while just releases water molecules and leaves a light yellow-colored compound which can be isolated after recrystallization from hot water as a well constituted large prism. As is clear from analysis with silver and ammonium salt, this substance is a monobasic acid and corresponds to general formula $C_5H_7NO_3$. The author terms tentatively the substance pyroglutamic acid.

When a new acid is formed from glutamic acid, some of the elements of water are considered to come from carboxyl group, while some from amide group, similarly as the case of carbostyril. Assuming that the structure of glutamic acid is asymmetrical (it is not considered absolutely to be a special assumption in consideration of its optical activity), pyroacid generated from glutamic acid is likely to have a similar atomic group as that of pyrrole derivatives. In fact, ignition of glutamic acid or its salt produces pyrrole which can be identified easily by its characteristic red color as that of sections of spruce

wood (pine) humidified with hydrochloric acid. The reaction corresponds to the formula shown below.

$$C_5H_9NO_4 = C_5H_7N + 2H_2O + CO_2$$

In addition to other products with high boiling point, ample quantities of pyrrole can be isolated by dry distillation of calcium pyrroglutamate, while the pyrrole is characterized by its boiling point, resinification with sulfuric acid, and formation of insoluble compound with metal double bond.

To report this unfinished study is nothing but the author's intention to show that he will continue to concentrate on this theme, and he promises that it is not long before further results can be reported.

Vienna, February 9, 1882

*147 F.3d 1358, *; 1998 U.S. App. LEXIS 12690, **;*
47 U.S.P.Q.2D (BNA) 1027

ROCKWELL INTERNATIONAL CORPORATION, Plaintiff-Appellant, v. THE UNITED STATES, Defendant-Appellee. and SDL, INC., Third Party Defendant/Cross-Appellant.

97-5065, 97-5068

UNITED STATES COURT OF APPEALS FOR THE FEDERAL CIRCUIT

147 F.3d 1358; 1998 U.S. App. LEXIS 12690; 47 U.S.P.Q.2D (BNA) 1027

June 15, 1998, Decided

PRIOR HISTORY: [1]** Appealed from: United States Court of Federal Claims. Judge Kenneth R. Harkins.

DISPOSITION: AFFIRMED-IN-PART, VACATED-IN-PART, and REMANDED-IN-PART.

CASE SUMMARY

PROCEDURAL POSTURE: Plaintiff appealed from the United States Court of Federal Claims, which granted summary judgment for defendants holding that claims of a patent were invalid for obviousness under 35 U.S.C.S. § 103(a). Defendants cross-appealed claiming the patent was invalid as anticipated under 35 U.S.C.S. §102.

OVERVIEW: Plaintiff filed suit against defendant United States and defendant government contractor alleging patent infringement of a process for growing semiconductor materials. The trial court found that all the asserted claims were invalid as obvious under 35 U.S.C.S. § 103(a). On appeal, the court held that the lower court erred in holding on summary judgment that the inventions of the patent would have been obvious. Thus, the court vacated that portion of the decision. The court affirmed the lower court's decision that genuine issues of material fact prevented summary judgment because the claims of the patent were anticipated. Assessing the prior art patents involved material factual issues genuinely in dispute, precluding summary judgment on anticipation. These material issues precluded a conclusion of obviousness. Defendants did not prove by clear and convincing evidence that the invention would have been obvious to one of ordinary skill in the art.

OUTCOME: The court vacated the lower court's decision since the court erred in holding on summary judgment that the inventions of the patent would have been obvious. The court affirmed the decision that genuine issues of material fact prevented summary judgment that the claims of the patent were anticipated.

CORE TERMS: patent, summary judgment, obviousness, reactor, semiconductor, cold-wall, invention, crystal, film, taught, epitaxial, anticipation, genuine, substrate, organometallic, issues of material fact, nonmovant, invalid, skill, alkyl, invalidity, secondary, preamble, subject matter, infringement, pyrolysis, compound, phase, layer, grow

LexisNexis(R) Headnotes ◆ Hide Headnotes

Civil Procedure > Summary Judgment > Standards > Appropriateness

Civil Procedure > Summary Judgment > Standards > Legal Entitlement

Civil Procedure > Summary Judgment > Standards > Materiality

HN1 Summary judgment is appropriate where there is no genuine issue as to any material fact and the moving party is entitled to a judgment as a matter of law. U.S. Ct. Cl. R. 56 (c). More Like This Headnote | *Shepardize:* Restrict By Headnote

Civil Procedure > Summary Judgment > Standards > General Overview

HN2 In determining the propriety of summary judgment, credibility determinations may not be made, and the evidence must be viewed favorably to the nonmovant, with doubts resolved and reasonable inferences drawn in the nonmovant's favor. More Like This Headnote | *Shepardize:* Restrict By Headnote

Civil Procedure > Summary Judgment > Burdens of Production & Proof > General Overview

HN3 In rendering a decision on a motion for summary judgment, a court must view the evidence presented through the prism of the substantive evidentiary burden that would inhere at trial. The moving party bears the burden of demonstrating the absence of genuine issues of material fact. More Like This Headnote | *Shepardize:* Restrict By Headnote

Civil Procedure > Summary Judgment > Appellate Review > Standards of Review

Civil Procedure > Appeals > Standards of Review > De Novo Review

HN4 The appellate court reviews de novo the trial court's grant of summary judgment. The underlying determination of invalidity, however, must be predicated on facts established by clear and convincing evidence. More Like This Headnote | *Shepardize:* Restrict By Headnote

Patent Law > Claims & Specifications > Enablement Requirement > General Overview

Patent Law > Inequitable Conduct > Effect, Materiality & Scienter > General Overview

Patent Law > Nonobviousness > Evidence & Procedure > Fact & Law Issues

HN5 Obviousness is a question of law based on underlying factual determinations. These underlying determinations include: (1) the scope and content of the prior art; (2) the level of ordinary skill in the art; (3) the differences between the claimed invention and the prior art; and (4) the extent of any proffered objective indicia of nonobviousness, sometimes termed secondary considerations. More Like This Headnote | *Shepardize:* Restrict By Headnote

Civil Procedure > Summary Judgment > Appellate Review > General Overview

Civil Procedure > Summary Judgment > Standards > General Overview

Patent Law > Nonobviousness > Elements & Tests > General Overview

HN6 In reviewing a summary judgment determination of obviousness, the court first determines anew whether the record raises any genuine issues of material fact. If facts remain in dispute, this court weighs the materiality of the dispute, i.e., whether resolution of the dispute one way or the other makes a difference to the final determination of obviousness. More Like This Headnote | *Shepardize:* Restrict By Headnote

Civil Procedure > Appeals > Standards of Review > De Novo Review

Patent Law > Infringement Actions > Claim Interpretation > General Overview

Patent Law > Jurisdiction & Review > Standards of Review > General Overview

HN7 The first step in any invalidity or infringement analysis is claim construction. Claim construction is a question of law, reviewed de novo on appeal. More Like This Headnote | *Shepardize:* Restrict By Headnote

Patent Law > Claims & Specifications > Claim Language > Preambles

Patent Law > Infringement Actions > Claim Interpretation > General Overview

HN8 When the claim drafter chooses to use both the preamble and the body to define the subject matter of the claimed invention, the invention so defined, and not some other, is the one the patent

protects. More Like This Headnote | *Shepardize:* Restrict By Headnote

Patent Law > Anticipation & Novelty > Fact & Law Issues

Patent Law > Jurisdiction & Review > Standards of Review > General Overview

HN9 Anticipation under 35 U.S.C.S. § 102 requires the disclosure in a single piece of prior art of each and every limitation of a claimed invention. Whether such art is anticipating is a question of fact. More Like This Headnote | *Shepardize:* Restrict By Headnote

Patent Law > Nonobviousness > Elements & Tests > Claimed Invention as a Whole

Patent Law > Nonobviousness > Elements & Tests > Ordinary Skill Standard

Patent Law > Nonobviousness > Elements & Tests > Prior Art

HN10 See 35 U.S.C.S. § 103(a). *Shepardize:* Restrict By Headnote

Patent Law > Nonobviousness > Elements & Tests > Claimed Invention as a Whole

Patent Law > Nonobviousness > Elements & Tests > Hindsight

Patent Law > Nonobviousness > Evidence & Procedure > Presumptions & Proof

HN11 In determining obviousness, the invention must be considered as a whole without the benefit of hindsight, and the claims must be considered in their entirety. Throughout the obviousness determination, a patent retains its statutory presumption of validity, and the movant retains the burden to show the invalidity of the claims by clear and convincing evidence as to underlying facts. More Like This Headnote | *Shepardize:* Restrict By Headnote

Patent Law > Claims & Specifications > Enablement Requirement > Standards & Tests

Patent Law > Nonobviousness > Elements & Tests > Prior Art

HN12 That prior art patents may have described failed attempts or attempts that used different elements is not enough. The prior art must be enabling. More Like This Headnote | *Shepardize:* Restrict By Headnote

Civil Procedure > Summary Judgment > Burdens of Production & Proof > General Overview

HN13 On summary judgment, the evidence must be viewed favorably to the nonmovant, with doubts resolved and reasonable inferences drawn in the nonmovant's favor. More Like This Headnote | *Shepardize:* Restrict By Headnote

Patent Law > Nonobviousness > Elements & Tests > Ordinary Skill Standard

Patent Law > Nonobviousness > Elements & Tests > Prior Art

Patent Law > Nonobviousness > Evidence & Procedure > Presumptions & Proof

HN14 The consistent criterion for determination of obviousness is whether the prior art would have suggested to one of ordinary skill in the art that this process should be carried out and would have a reasonable likelihood of success. More Like This Headnote | *Shepardize:* Restrict By Headnote

Patent Law > Nonobviousness > Elements & Tests > General Overview

HN15 Evidence of secondary considerations is but a part of the totality of the evidence that is used to reach the ultimate conclusion of obviousness. In some cases this evidence is the most probative of obviousness, but its existence or non-existence does not control the obviousness determination. More Like This Headnote

HN16 In resolving a summary judgment motion inferences may not be drawn against the nonmovant and adverse credibility determinations may not be made. More Like This Headnote | *Shepardize:* Restrict By Headnote

COUNSEL: Richard S. Florsheim, Foley & Lardner, of Milwaukee, Wisconsin, argued for plaintiff-appellant. With him on the brief were Bernhard D. Saxe and Larry L. Shatzer, II, of Washington, D.C.

John Fargo, Assistant Director, Commercial Litigation Branch, Civil Division, Department of Justice, of Washington, D.C., argued for defendant-appellee. With him on the brief were Frank W. Hunger, Assistant Attorney General, Vito J. DiPietro, Director, and Chun-I Chiang, Attorney.

Michael M. Carlson, Morrison & Foerster LLP, of Palo Alto, California, argued for third party defendant/cross-appellant. With him on the brief were Marc J. Pernick of Palo Alto, California, and Preston Moore, of San Francisco, California.

JUDGES: Before NEWMAN, MICHEL and CLEVENGER, Circuit Judges.

OPINION BY: MICHEL

OPINION:

[*1360] MICHEL, Circuit Judge.

Rockwell International Corporation ("Rockwell") appeals the decision on summary judgment of the United States Court of Federal Claims in Rockwell International Corp. v. United States, 37 Fed. Cl. 478 (1997), holding all asserted [**2] claims of United States Patent No. 4,368,098 (the " '098 patent") invalid for obviousness under 35 U.S.C. § 103(a) (Supp. I 1995). Defendant-appellee, the United States and third-party defendant/cross-appellant, SDL, Inc. n1 (collectively, "Defendants") assert that the trial court's summary judgment that the claimed inventions of the '098 patent would have been obvious should be affirmed, and SDL cross-appeals the trial court's holding that genuine issues of material fact prevented a determination on summary judgment of anticipation under 35 U.S.C. § 102, asserting that the claimed inventions of the '098 patent also should have been found invalid as anticipated.

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N1 SDL, Inc. is also known as Spectra Diode Labs, Inc.

- - - - - - - - - - - - - End Footnotes- - - - - - - - - - - - -

This appeal was submitted for our decision following oral argument on March 3, 1998. We have jurisdiction over a final decision of the Court of Federal Claims pursuant to 28 U.S.C. § 1295(a)(3) (1994). Because the Court of Federal Claims erred in holding on summary judgment that the inventions [**3] of the '098 patent would have been obvious, we vacate that portion of the decision and remand the case for further proceedings. On the cross-appeal, we affirm the decision of the Court of Federal Claims that genuine issues of material fact prevented summary judgment that the claims of the '098 patent were anticipated.

BACKGROUND

Rockwell filed suit against the United States on August 30, 1993, alleging infringement of various claims of its '098 patent and identifying sixteen government contractors alleged to have participated in the infringement. n2 SDL, one of those contractors, received a notice from the United States under RCFC n3 14 (a)(1) & (c) but initially did not appear because SDL believed that its liability as an indemnitor was not high enough. In May 1995, however, Rockwell sued SDL for infringement of the same patent in the United States District Court for the Northern District of California. In June 1995, SDL intervened in the Court of Federal Claims action as a third-party defendant, and in September 1995, the district court action was suspended pending disposition of the validity [*1361] issues in the action pending in the Court of Federal Claims.

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n2 Each of the contractors apparently had an interest in this action because their respective contracts with the United States may have obligated them to indemnify the United States should it lose a litigation as a defendant regarding items covered by their procurement contracts. See Rockwell Int'l Corp. v. United States, 31 Fed. Cl. 536, 537 (1994) (decision denying motion of another contractor to quash notice under RCFC 14(a)(1) and (c) or for an extension of time). [**4]

n3 Rules of the Court of Federal Claims.

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Prior to SDL's intervention, Rockwell and the United States had obtained a scheduling order that trial would proceed in phases based on categories of accused infringing equipment as follows: (1) night vision equipment; (2) photo voltaic cells; and (3) laser diodes in semiconductor devices. Claim construction and validity were to be decided in phase 1 and applied to all three phases. This appeal and cross-appeal relate to whether the '098 patent is invalid.

The '098 patent claims a process called MOCVD n4 for growing Group III/V semiconductor materials. Chemical vapor deposition ("CVD") is a process for depositing a thin film of material onto a substrate by reacting the constituent elements in gaseous phase. CVD processes are used to produce thin, single crystal films called epitaxial films. Prior to the invention of the '098 patent, other CVD processes had been used to grow similar Group III/V semiconductor films.

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n4 MOCVD: Metal-organic chemical vapor deposition. A technique for growing thin layers of compound semiconductors in which metal organic compounds, having the formula MRx, where M is a Group III metal and R is an organic radical, are decomposed near the surface of a heated substrate wafer, in the presence of a hydride of Group V element. McGraw-Hill Dictionary of Scientific and Technical Terms 1250 (5th ed. 1994).

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The '098 patent identifies specific groups of reactants to be used in CVD processes. The reactant supplying the Group III element is to be an organometallic alkyl, and the Group V reactant is to be a hydride or a halide-free alkyl compound. Dr. Harold M. Manasevit first filed his patent application on the MOCVD process on February 13, 1968. After numerous continuations and continuations-in-part, the application issued as the '098 patent on January 11, 1983.

In phase 1 of the litigation, Rockwell asserted infringement of at least independent claims 1, 2, and 3. Defendants asserted that claims 1, 2, and 3 are invalid under sections 102, 103, and 112 of Title 35. SDL further asserted invalidity for failure to claim statutory subject matter under section 101. Rockwell filed a motion for summary judgment that claims 1 and 3 were not invalid, which was denied. Defendants filed motions for summary judgment of anticipation, which were denied, and of obviousness, which were granted.

The trial court held that because neither Rockwell's own motion for summary judgment that claims 1 and 3 are not invalid nor its consolidated opposition to Defendants' motions urging the invalidity of claims [**6] 1, 2, 3, 11, 35, 40, 44, 50, 55-58, 66, and 72 separately defended independent claim 2 or any of the other claims of the '098 patent, claim 2 and all of the other claims stand or fall with the decision on claims 1 and 3. See 37 Fed. Cl. at 492; see also Rockwell Int'l Corp. v. United States, No. 93-542C, slip op. at 3-4 (Apr. 1, 1997) (order denying Rockwell's motion for reconsideration). n5

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n5 In its appeal, Rockwell challenges the trial court's disposal of all of the claims of the '098 patent. Because we vacate and remand the trial court's summary judgment of obviousness on the asserted claims, we need not address whether all of the claims of the '098 patent stand or fall with the asserted ones.

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The trial court found that during prosecution, the claims of the '098 patent were limited to a CVD process using a cold-wall reactor. Rockwell, 37 Fed. Cl. at 485. In making its obviousness determination, the trial court found that every limitation in the process claimed in independent claims 1 and 3 was recited [**7] in four prior art patents "or elsewhere in the CVD prior art." Id. at 496. The trial court therefore found that all of the asserted claims were invalid under section 103(a). Rockwell timely appealed to this court.

DISCUSSION

HN1 Summary judgment is appropriate where "there is no genuine issue as to any material fact and . . . the moving party is entitled to a judgment as a matter of law." RCFC 56(c). HN2 In determining the propriety of summary judgment, credibility determinations may not be made, and the evidence must be viewed favorably to the nonmovant, with doubts resolved and reasonable inferences drawn in the nonmovant's favor. See SRI Int'l v. Matsushita Elec. Corp., 775 F.2d 1107, 1116, [*1362] 227 U.S.P.Q. (BNA) 577, 581-82 (Fed. Cir. 1985) (in banc).

HN3 "In rendering a decision on a motion for summary judgment, a court must 'view the evidence presented through the prism of the substantive evidentiary burden' that would inhere at trial." Monarch Knitting Mach. Corp. v. Sulzer Morat Gmbh, 139 F.3d 877, 880, 45 U.S.P.Q.2D (BNA) 1977, 1981 (Fed. Cir. 1998) (quoting Anderson v. Liberty Lobby, Inc., 477 U.S. 242, 254, 91 L. Ed. 2d 202, 106 S. Ct. 2505 (1986)). The moving party "bears the burden [**8] of demonstrating the absence of genuine issues of material fact." Conroy v. Reebok Int'l, Ltd., 14 F.3d 1570, 1575, 29 U.S.P.Q.2D (BNA) 1373, 1377 (Fed. Cir. 1994). HN4 We review de novo the trial court's grant of summary judgment. See Celotex Corp. v. Catrett, 477 U.S. 317, 323, 91 L. Ed. 2d 265, 106 S. Ct. 2548 (1986); Conroy, 14 F.3d at 1575, 29 U.S.P.Q.2D (BNA) at 1377. The underlying determination of invalidity, however, must be predicated on facts established by clear and convincing evidence. See National Presto Indus. v. West Bend Co., 76 F.3d 1185, 1189, 37 U.S.P.Q.2D (BNA) 1685, 1687 (Fed. Cir. 1996).

HN5 Obviousness is a question of law based on underlying factual determinations. See Richardson-Vicks, Inc. v. Upjohn Co., 122 F.3d 1476, 1479, 44 U.S.P.Q.2D (BNA) 1181, 1183 (Fed. Cir. 1997). These underlying determinations include: (1) the scope and content of the prior art; (2) the level of ordinary skill in the art; (3) the differences between the claimed invention and the prior art; and (4) the extent of any proffered objective indicia of nonobviousness, sometimes termed secondary considerations. See Graham v. John Deere Co., 383 U.S. 1, 17-18, 15 L. Ed. 2d 545, 86 S. Ct. 684 (1966). [**9] HN6 In reviewing a summary judgment determination of obviousness, therefore, this court first determines anew whether the record raises any genuine issues of material fact. See Monarch, 139 F.3d at 881, 45 U.S.P.Q.2D (BNA) at 1981. "If facts remain in dispute, this court weighs the materiality of the dispute, i.e., whether resolution of the dispute one way or the other makes a difference to the final determination of obviousness." Id.

I. Claim Construction

HN7 The first step in any invalidity or infringement analysis is claim construction. See Beachcombers v. WildeWood Creative Prods., Inc., 31 F.3d 1154, 1160, 31 U.S.P.Q.2D (BNA) 1653, 1660 (Fed. Cir. 1994). Claim construction is a question of law, reviewed de novo on appeal. See Cybor Corp. v. FAS Techs., Inc., 138 F.3d 1448, 1454, 46 U.S.P.Q.2D (BNA) 1169, 1173 (Fed. Cir. 1998) (in banc).

The trial court first determined that the preambles of independent claims 1 through 3 operated as claim limitations. n6 See Rockwell, 37 Fed. Cl. at 488. The trial court found:

> If the preamble language is not used, there would be no claim limitations regarding the growing of epitaxial films or the type of substrate used in the process. The [**10] patent when read in its entirety reads toward the process of the growth of a particular type of film, Group III-V semiconductor, and a certain process for doing that very growth.

Id. The patent's written description repeatedly discloses that it is directed to a process for producing an epitaxial film of a Group III/V semiconductor. See, e.g., '098 patent, col. 1, ll. 18; col. 2, ll. 56-57; col. 3, ll. 51-52; col. 4, ll. 46-47; col. 5, ll. 29-31; col. 8, ll. 13-14; col. 10, ll. 42-43. Similar language is contained in the preambles. HN8 "When the claim drafter chooses to use both the preamble and the body to define the subject matter of the claimed invention, the invention so defined, and not some other, is the one the patent protects." Bell Communications Research, Inc. v. Vitalink Communications [*1363] Corp., 55 F.3d 615, 620, 34 U.S.P.Q.2D (BNA) 1816, 1820 (Fed. Cir. 1995); see also In re Paulsen, 30 F.3d 1475, 1479, 31 U.S.P.Q.2D (BNA) 1671, 1673 (Fed. Cir. 1994) ("Terms appearing in a preamble may be deemed limitations of a claim when they give meaning to the claim and properly define the invention.").

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n6 Independent claim 1 is representative for purposes of this appeal and is reproduced below:

> 1. An organo-metallic process for producing an epitaxial film of Group III-V semiconductor disposed on a single crystal substrate, said process employing an open reactor and comprising the steps of:
>
> heating said substrate in said open reactor,
>
> introducing into said open reactor a fist [sic] material containing a hydride or halide-free alkyl compound of at least one Group V constituent of said semiconductor, and, as a second material, at least one halide-free alkyl compound containing at least one of the Group III constituents of said semiconductor, and
>
> exhausting said open reactor to pressure not greater than one atmosphere.

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The trial court further interpreted the independent claims as reflecting a narrowing of the claim scope during prosecution, concluding that the claimed "open reactor" must be an "open cold-wall reactor." Rockwell, 37 Fed. Cl. at 490. The trial court found that "Dr. Manasevit meant to limit his invention/process to the use of cold-wall reactor. He had to in order to avoid obviousness under the Ruehrwein patents." Id. None of the parties challenges this construction by the trial court. We agree that the claims of the '098 patent were limited during prosecution by Dr. Manesevit to an open cold-wall reactor. For example, in response to the third Office action rejecting the claim that would become claim 1, Dr. Manasevit asserted that "by contrast [to the Ruehrwein patent], the present process discloses the use of a 'cold wall' process." Id. at 489.

Although the parties agree that the claims are limited to cold-wall reactors, SDL contends that the trial court improperly adopted the definition of cold-wall reactor asserted by Rockwell instead of the definition asserted by SDL. In response to the third Office action rejection based on Reuhrwein, Dr. Mansevit referenced [**12] "the article by Stringfellow et al., supra, at pages 50 and 54 which discusses and distinguishes cold wall versus hot wall apparatus and related organometallic processes." n7 In that article, the authors defined a cold-wall system as one "where only the graphite pedestal is heated (by rf induction heating) and the SiO walls remain cool even though no special water or forced air cooling is employed." Id. at 490. The trial court held that Dr. Manasevit incorporated the definition of cold-wall reactor from the Stringfellow et al., article. Id. The trial court thus defined a cold-wall reactor as one in which heat is applied at the substrate and the walls are kept significantly cooler than the substrate.

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n7 The inventor was citing G.B. Stringfellow and H.T. Hall, 43 J. Crystal Growth 47 (1978).

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SDL agrees that the Stringfellow article was an appropriate place to find the definition of cold-wall reactor. However, SDL asserts that the definition adopted by the trial court misreads the article and that the [**13] definition supplied by its expert, the same Dr. Stringfellow, should be adopted. According to SDL, Dr. Stringfellow's summary, in his declaration, of the statements made in his article lead to the following definition of a cold-wall reactor: "a reactor in which the walls of the reaction chamber are kept cool enough to avoid significant pyrolysis of the reactants on or near the walls of the reactor." Declaration of Gerald B. Stringfellow, Ph.D., in support of the Cross-Motion of SDL, Inc. for Summary Judgment and Response to Motion for Summary Judgment by Rockwell, pp. 17-20 (May 2, 1996). Thus, SDL asserts that not only must a cold-wall reactor's walls be significantly cooler than the substrate, but also be cool enough that no significant pyrolysis occurs on or near the walls.

We agree, however, with the trial court's analysis of the definition of cold-wall reactor. As the trial court noted, although SDL is correct that "a cold-wall reactor may have significantly less pyrolysis on the walls of the chamber than the hot-wall reactor, [that] is the reason to use a cold-wall reactor and not the meaning of a cold-wall reactor." 37 Fed. Cl. at 490. Furthermore, the article does not indicate [**14] that pyrolysis cannot occur near the walls of a cold-wall reactor. Rather, it indicates that the whole point of a cold-wall system is to get the substrate much hotter than the reactor walls. We therefore hold that the definition of cold-wall reactor adopted by the trial court is correct.

II. Anticipation

HN9 Anticipation under 35 U.S.C. § 102 requires the disclosure in a single piece of prior art of each and every limitation of a claimed invention. See Electro Med. Sys. S.A. v. Cooper Life Sciences, 34 F.3d 1048, 1052, 32 U.S.P.Q.2D (BNA) 1017, 1019 (Fed. Cir. 1994). Whether such art is anticipating is a question of fact. See Scripps Clinic & Research Found. v. Genentech, Inc., 927 F.2d 1565, 1576, [*1364] 18 U.S.P.Q.2D (BNA) 1001, 1010 (Fed. Cir. 1991).

The four prior art patents analyzed by the trial court for both its anticipation and its obviousness determinations were: U.S. Pat. No. 3,266,270 (the "Miederer Patent"), U.K. Pat. No. 778,383 (the "Scott Patent"), U.S. Pat. No. 3,364,084 and U.K. Pat. No. 1,011,979 (the "Ruehrwein Patents"). (The only patent in this group that was cited as a reference during the prosecution of the '098 patent was the U.S. Ruehrwein patent.)

The trial court [**15] determined that genuine issues of material fact remained concerning what was disclosed in the prior art cited by Defendants. Rockwell, 37 Fed. Cl. at 503-05. Specifically, the trial court concluded that "material issues of fact in dispute preclude summary disposition of whether the works of Drs. Stearns and Thomas qualify as prior art under section 102(g)." n8 Id. at 503. Further, the trial court determined:

> The question of whether the Miederer patent contains the single crystal substrate element is a dispute of fact that is material.
>
> . . . The question of whether the terms of Miederer patent provides a [sic] sufficient basic chemistry information to enable one skilled in the art to achieve epitaxial single crystalline semiconductors, presents a material issue of fact that needs to be clarified with further ventilation through expert testimony.

Id. at 504-05. In addition, the trial court held that "there is a genuine dispute of material fact as to whether the [Scott] patent terms provide sufficient basic chemistry information to enable one skilled in the art to grow epitaxial single crystalline semiconductors." Id. at 505. Finally, the trial [**16] court determined that "the information in the summary judgment papers is not sufficient to resolve the differences in expert opinion" as to whether the Ruehrwein patents taught single crystal growth using organometallics. Id. Hence, of the four prior art patents cited by Defendants, the trial court did not find that any one taught single crystal growth of a Group III/V semiconductor using organometallics. Defendants have not shown that the trial court erred in identifying these genuine issues of material fact. Nor on appeal have Defendants

indisputably shown that any of the four patents teaches such single crystal growth of Group III/V semiconductors. The trial court's determination, therefore, that there is a genuine dispute of material fact as to whether any of the four prior art references relied upon by Defendants taught a successful process for the growth of an epitaxial film using organometallics is affirmed.

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n8 Defendants assert that the works of Drs. Stearns and Thomas are prior art, but the trial court found that it was unclear on the summary judgment record if Drs. Stearns and Thomas reduced the invention to practice prior to February 7, 1967, the date of reduction to practice of the invention claimed in the '098 patent. The trial court does not appear to have used these works in its anticipation analysis, but to the extent that the trial court used these teachings on summary judgment either of anticipation or of obviousness, it erred because of its finding that a genuine issue of material fact existed regarding reduction to practice.

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III. Obviousness

Under 35 U.S.C. § 103(a),

> [a] HN10 patent may not be obtained . . . if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.

HN11 In determining obviousness, the invention must be considered as a whole without the benefit of hindsight, and the claims must be considered in their entirety. See W.L. Gore & Assocs. v. Garlock, Inc., 721 F.2d 1540, 1551, 220 U.S.P.Q. (BNA) 303, 312-13 (Fed. Cir. 1983); see also Medtronic, Inc. v. Cardiac Pacemakers, Inc., 721 F.2d 1563, 1567, 220 U.S.P.Q. (BNA) 97, 101 (Fed. Cir. 1983). Throughout the obviousness determination, a patent retains its statutory presumption of validity, see 35 U.S.C. § 282, and the movant retains the burden to show the invalidity of the claims by clear and convincing evidence as to underlying facts, see Glaverbel Societe Anonyme v. Northlake Mktg. & Supply, Inc., 45 F.3d 1550, 1555, 33 U.S.P.Q.2D (BNA) 1496, 1499 (Fed. Cir. 1995); Ryko Mfg. Co. v. Nu-Star, [*1365] Inc., 950 F.2d 714, 716, 21 [**18] U.S.P.Q.2D (BNA) 1053, 1055 (Fed. Cir. 1991).

A. Genuine Issues About the Content of the Prior Art Precluded a Determination of Obviousness on Summary Judgment

After determining that genuine issues of material fact existed with respect to the prior art cited to prove anticipation, the trial court nevertheless accepted the assertions of Defendants as to the content of the same prior art patents for its obviousness analysis. From these assertions, it found that each limitation of the process claimed in the '098 patent "is taught by the combination of the Miederer, Scott and Ruehrwein patents, or elsewhere in the CVD prior art." Rockwell, 37 Fed. Cl. at 496.

Before the trial court and on appeal, Rockwell disputes this determination, contending that Defendants' obviousness challenge "does not include 'a single piece of prior art reporting the growth of gallium arsenide (or any other III/V semiconductor) single crystals using organometallic reagents,'" id., the same limitation whose presence in the prior art the trial court found materially disputed. HN12 That prior art patents may have described failed attempts n9 or attempts that used different elements n10 is not enough. The prior [**19] art must be enabling. n11 See Motorola, Inc. v. Interdigital Tech. Corp., 121 F.3d 1461, 1471, 43 U.S.P.Q.2D (BNA) 1481, 1489 (Fed. Cir. 1997) ("In order to render a claimed apparatus or method obvious, the prior art must enable one skilled in the art to make and use the apparatus or

method." (quoting Beckman Instruments, Inc. v. LKB Produkter AB, 892 F.2d 1547, 1551, 13 U.S.P.Q.2D (BNA) 1301, 1304 (Fed. Cir. 1989))). Because none of the four patents alone taught this limitation, Defendants had the burden to prove that combining these references would suggest to one of ordinary skill in the art how to perform the missing process step with a reasonable likelihood of success. See In re Dow Chem. Co., 837 F.2d 469, 473, 5 U.S.P.Q.2D (BNA) 1529, 1531 (Fed. Cir. 1988); cf. Miles Lab., Inc. v. Shandon, Inc., 997 F.2d 870, 878, 27 U.S.P.Q.2D (BNA) 1123, 1128-29 (Fed. Cir. 1993) ("The differences between the prior art and [the patent claim] were minor and achievable by simple modification. Moreover, the prior art references collectively suggest the engineering necessary to achieve these modifications."). Defendants did not show the trial court any prior art patent or combination of prior art patents that taught [**20] with a reasonable likelihood of success how to grow a single crystal film of Group III/V semiconductor material on a substrate using organometallic reagents.

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n9 For example, the trial court found that the Miederer patent taught the use alkyl gallium along with AsCl [3] to deposit a GaAs layer on a semiconductor rod substrate, but the trial court also found a material issue of fact as to whether one could grow epitaxial layers by following the procedure disclosed in Miederer. In fact, there was evidence by the inventor himself that the example in his patent did not accomplish epitaxial growth: "I did not accomplish my ultimate goal of growing a single crystal film of gallium arsenide; rather, the film I grew was polycrystalline." Although the inventor further stated that his "inability to grow epitaxial layers was not the result of any deficiency in the process . . . but rather the result of the inadequacy of the facilities available . . .," there were differences between the failed Miederer process and the successful one disclosed in the '098 patent that also may have contributed to that failure. [**21]

n10 For example, the trial court found that there was a genuine issue of material fact as to whether the Ruehrwein patents specifically disclosed Group III alkyls in combination with alkyls or hydrides of Group V. Furthermore, the trial court found that "SDL's expert in his deposition stated that organometallic [pyrolysis] in a hot wall chamber would not create single crystalline epitaxy." Rockwell, 37 Fed. Cl. at 505.

n11 The district court found a disputed issue of fact with respect to the enablement of epitaxial layer growth using the Scott patent. Rockwell's expert asserted that Scott would not enable a knowledgeable person to produce epitaxial film no matter what the operator's skill, but SDL's expert asserted otherwise.

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B. Inferences May Not Be Drawn Against the Nonmovant on Summary Judgment

1. The Trial Court Cannot Infer that One of Ordinary Skill in the Art Would Have Known How to Achieve Epitaxial Growth

Rockwell argues that the lack of any teaching in the prior art that single crystal [*1366] films of III/V semiconductor materials may successfully be grown [**22] is dispositive as to obviousness. The trial court held, however, that "obviousnss standards under section 103 do not require such a showing. Invalidity for obviousness requires a showing that the prior art viewed as a whole would have suggested the claimed process to one skilled in the art." Rockwell, 37 Fed. Cl. at 496. By assuming and not determining whether any prior art reference taught or suggested the process steps for successful growth of a single crystal film, the trial court drew an inference against the nonmovant, Rockwell. However, HN13 on summary judgment, the evidence must be viewed favorably to the nonmovant, with doubts resolved and reasonable inferences drawn in the nonmovant's favor. See SRI Int'l, 775 F.2d at 1116, 227 U.S.P.Q. (BNA) at 581-82.

The trial court had earlier determined with respect to anticipation that none of the prior art patents taught single crystal growth of Group III/V semiconductors using organometallics. Therefore, with respect to obviousness, the trial court could not simply find that these four patents, when combined with each other

and unidentified "other CVD prior art," taught the very limitation that admittedly none of them taught separately. [**23] Such a determination required the assumption or inference against Rockwell, the nonmovant, that somewhere in some prior art single crystal growth of Group III/V semiconductors was taught, and one of ordinary skill in the art would have known. Although there may be cases when the addition of the missing limitation would be clear to anyone looking at the problem, this is not one of those cases.

Single crystal growth of a Group III/V semiconductor using an organometallic reagent is a specific limitation of the claims of the '098 patent. The trial court's determination, therefore, that "the Obviousness Claims Charts show that Miederer, Scott and Ruehrwein patents, when combined contain all of the elements included in claims 1 and 3 of the '098 patent," 37 Fed. Cl. at 497, is not legally sufficient. It cannot support the conclusion that all of the claims in the '098 patent are invalid for obviousness on the summary judgment record because doing so requires drawing of an adverse inference. Rather HN14"the consistent criterion for determination of obviousness is whether the prior art would have suggested to one of ordinary skill in the art that this process should be carried out and would have a [**24] reasonable likelihood of success." Dow, 837 F.2d at 473, 5 U.S.P.Q.2D (BNA) at 1531; see also United States Surgical Corp. v. Ethicon, Inc., 103 F.3d 1554, 1564, 41 U.S.P.Q.2D (BNA) 1225, 1233 (Fed. Cir. 1996). On the summary judgment record before this court, Defendants have not pointed specifically to any such suggestion.

We agree with the trial court that assessing the prior art patents involved material factual issues genuinely in dispute, precluding summary judgment of anticipation. We must take the next step, however, and hold that these material issues also precluded a conclusion of obviousness on summary judgment. Because of the presence of genuine issues of material fact regarding whether on this record the prior art patents taught a successful process for epitaxial growth of Group III/V semiconductors using organometallics, Defendants have not proven by clear and convincing evidence that the invention defined in the claims of the '098 patent would have been obvious to one of ordinary skill in the art and that therefore they are entitled to judgment. We hold, on this record, that the Court of Federal Claims legally erred in determining on summary judgment that the claimed invention would [**25] have been obvious.

2. Inferences Adverse to the Nonmovant Regarding Secondary Considerations of Nonobviousness Are Also Impermissible on Summary Judgment

HN15Evidence of secondary considerations is but a part of the "totality of the evidence" that is used to reach the ultimate conclusion of obviousness. See Richardson-Vicks, 122 F.3d at 1483, 44 U.S.P.Q.2D (BNA) at 1187 (citing Kansas Jack, Inc. v. Kuhn, 719 F.2d 1144, 1151, 219 U.S.P.Q. (BNA) 857, 862 (Fed. Cir. 1983)). In some cases this evidence is the most probative of obviousness, but its existence or non-existence does not control the obviousness determination. See id. Because we hold that genuine issues of material fact relating to the first three Graham factors preclude determination of obviousness [*1367] on summary judgment, we need not ascertain whether these secondary considerations are determinative of nonobviousness here. The trial court held that Rockwell had not shown how any of the secondary considerations were the result of the merits of the claimed invention. We again note, however, that HN16in resolving a summary judgment motion inferences may not be drawn against the nonmovant and adverse credibility determinations may [**26] not be made. See SRI Int'l, 775 F.2d at 1116, 227 U.S.P.Q. (BNA) at 581-82. Further, Rockwell did present its own evidence of secondary considerations based upon which a reasonable inference could be drawn in favor of nonobviousness. After further development of the evidence, the trial court may be able properly to determine in which direction these relevant indicia push and whether they would change what otherwise would be the decision of obviousness vel non.

CONCLUSION

The decision that Defendants had not proven anticipation so as to support a grant of summary judgment is affirmed. Further, the evidence in the summary judgment record raises genuine issues of material fact concerning the obviousness determination. Accordingly, the summary judgment of the Court of Federal Claims holding the '098 patent invalid for obviousness is vacated and the case is remanded for further proceedings on obviousness, anticipation and any other issues necessary to conclude the lawsuit.

AFFIRMED-IN-PART, VACATED-IN-PART, and REMANDED-IN-PART

COSTS

Each party shall bear its own costs.

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